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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/507,524	09/14/2004	Kazuhisa Miyagawa	101249.55411US	6746

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Crowell & Moring  
P O Box 14300  
Washington, DC 20044-4300

EXAMINER
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DHINGRA, RAKESH KUMAR

ART UNIT	PAPER NUMBER
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1792

MAIL DATE	DELIVERY MODE
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08/12/2008

PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/507,524	<b>Applicant(s)</b> MIYAGAWA, KAZUHISA	
	<b>Examiner</b> RAKESH K. DHINGRA	<b>Art Unit</b> 1792	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 03 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 03 June 2008.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-21 is/are pending in the application.
- 4a) Of the above claim(s) 4-13 and 15-21 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☐ Claim(s) 1-3 and 14 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 14 September 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)          | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)          | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____  | 6) <input type="checkbox"/> Other: _____                          |

## **DETAILED ACTION**

### ***Continued Examination Under 37 CFR 1.114***

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 6/3/08 has been entered.

### ***Response to Arguments***

Applicant's arguments with respect to claims 1-3 and 14 have been considered but are moot in view of the new ground(s) of rejection as explained hereunder.

Applicant has amended claim 1 by adding new limitation "current through said two parallel conductors flow in opposition to each other".

Claims 1-21 are now pending out of which claims 1-3 and 14 are active.

New reference by Khater et al (US 6,028,285) when combined with Becker et al reads on amended claim 1 limitations. Accordingly claims 1, 14 have been rejected under 35 USC 103 (a) as explained below. Balance claims 2, 3 have also been rejected under 35 USC 103 (a) as explained below.

Further, in view of amendment to claim 1 the double patenting rejection is withdrawn.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

**Claims 1, 14 are rejected under 35 U.S.C. 103(a) as being anticipated by Khater et al (US 6,028,285) in view of Becker et al (US 6,531,031).**

Regarding Claims 1, 14: Khater et al teach a plasma processing apparatus comprising:  
a transmission line (antenna source) 10 that is connected to a high-frequency power supply 22 and that has a termination impedance (terminal) thereof used to attain an impedance match, wherein:

an electromagnetic field is generated by the transmission line (source) 10,  
two parallel conductors 11, 13 constituting said transmission line 10 are horizontal and disposed one above the other, and current through said two parallel conductors flow in opposition to each other. Khater et al also teach that the use of a planar spiral coil may result in azimuthal process asymmetries and non-uniformities, and that the uniformity of the plasma density and ion flux profiles to the wafer surface are also influenced by the transmission line properties {claim limitation “terminal thereof” is interpreted as a load impedance coupled to

Art Unit: 1792

terminal of the balanced transmission line” in line with applicant’s disclosure at page 8, lines 22-25 of specification. Applicant is invited to clarify/amend the claim}[e.g. Figs. 1-3 and col. 5, line 55 to col. 9, line 15].

Khater et al do not explicitly teach the transmission line is a balanced transmission line.

Becker et al teach a plasma apparatus wherein an inductive plasma generating coil 6 is supplied with balanced high frequency power at feed points 32, 31 such that a  $\lambda/2$  phase delay is introduced in between the power introduced at the two feed points 32, 31. Becker et al further teach that the power fed through balanced transmission lines 40 is balanced by adjusting impedance using capacitors 24-27 (e.g. Fig. 1-3 and col. 7, line 30 to col. 7, line 45). It would be obvious to use the balun as taught by Becker et al in the apparatus of Khater et al to obtain uniform plasma by reducing process asymmetries.

Therefore it would have been obvious to one of ordinary skills in the art at the time of the invention to modify the high frequency feed system for the antenna coil by a balun to obtain a balanced transmission line structure as taught by Becker et al in the apparatus of Khater et al to obtain uniform plasma by reducing process asymmetries (Becker et al –col. 3, line 40 to col. 4, line 65).

Regarding Claim 14: Khater et al in view of Becker et al teach the balanced transmission line is connected to high frequency power supply 23 over a coaxial cable via a balun (that includes electrical conductors 40, phase delay line 30 etc) {Khater et al - Figs. 1-3 and Becker et al - Figs. 2, 3).

**Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Khater et al (US 6,028,285) in view of Becker et al (US 6,531,031) as applied to claim 1 and further in view of Pu et al (US 2001/0054383).**

Regarding Claim 2: Khater et al in view of Becker et al teach all limitations of the claim except that the balanced transmission line is disposed inside the chamber.

However it is known in the art to dispose electromagnetic wave generating antenna (balanced transmission line) either inside or outside the process chamber.

Pu et al teach an inductive plasma apparatus comprising a vacuum chamber with aluminum side walls 12 and an antenna array 30 mounted on the dielectric chamber lid 10. Pu et al also teach that the array of antenna coils can be mounted either inside or outside the vacuum chamber, depending upon process limitations like like the type of plasma gases to which the antenna would be exposed inside the chamber, and the electromagnetic coupling required with the plasma gases during plasma processing (e.g. Fig. 1 and para. 0004, 0013, 0035-0041).

Therefore it would have been obvious to one of ordinary skills in the art at the time of the invention to dispose the balanced transmission line inside the vacuum chamber as taught by Pu et al in the apparatus of Khater et al in view of Becker et al as per process limitations like the type of plasma gases to which the antenna would be exposed inside the chamber, and the electromagnetic coupling required with the plasma gases during plasma processing.

**Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Khater et al (US 6,028,285) in view of Becker et al (US 6,531,031) and Pu et al (US 2001/0054383) as applied to claim 2 and further in view of Tobe et al (US 5,891,349).**

Regarding Claim 3: Khater et al in view of Becker et al and Pu et al teach all limitations of the claim including a balanced transmission line 10 and a gas inlet 90 but do not teach that the gas inlet is formed above said balanced transmission line.

Tobe et al teach a plasma processing apparatus that produces gas plasma in a vacuum chamber 20 by generating an electromagnetic field so as to treat an object 21 by plasma, and comprising a coil electrode 61 (balanced transmission line) connected to high frequency power supply 52 through lines 62, 63 (transmission line). Tobe et al further teach a gas inlet 30 that is formed above the balanced transmission line 61 (e.g. Fig. 1, 11A and col. 7, line 65 to col. 8, line 45 and col. 9, lines 32-38).

Therefore it would have been obvious to one of ordinary skills in the art at the time of the invention to provide a gas inlet above the balanced transmission line as taught by Tobe et al in the apparatus of Khater et al in view of Becker et al and Pu et al to maximize coupling of electromagnetic energy with the plasma generating gas.

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to RAKESH K. DHINGRA whose telephone number is (571)272-5959. The examiner can normally be reached on 8:30 -6:00 (Monday - Friday).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Parviz Hassanzadeh can be reached on (571)-272-1435. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Rakesh K Dhingra/  
Examiner, Art Unit 1792

/K. M./  
Primary Examiner, Art Unit 1792